AMENDMENTS TO THE CLAIMS:

The following listing of claims supersedes all prior versions and listings of claims in this application:

1. (Currently Amended) A method of matched filtering in accordance with a reference signal sequence comprising a plurality of signal samples at regular sampling time intervals λ, said method comprising the use of apparatus to effect the following operations:

receiving an input time domain signal r(t) to be filtered, said signal r(t) representing at least one physical characteristic of at least one tangible thing;

sampling the input time domain signal r(t), at sampling time intervals τ that are not synchronized to the sampling intervals λ of the reference signal sequence, to produce an input signal sequence;

computing the Fourier transform of [[a]] the input signal to be filtered evaluated at discrete frequencies f determined by the intervals τ at which the input signal is sampled;

computing the Fourier transform of [[a]] the reference sequence, evaluated at the same discrete frequencies f; ~~to which the filter is to be matched; and~~

forming the product of the two Fourier transforms; and

computing the inverse Fourier transform of said product to produce an output time domain signal y(t) representing a filtered version of the input time domain signal, now transformed to provide a more useful representation of said at least one physical characteristic of said at least one tangible thing;

wherein ~~characterised in that~~ the reference sequence is defined as a function of time by a process of iteratively combining shifted versions of shorter sequences, and ~~the step of~~

wherein computing the Fourier transform of the reference sequence comprises an iterative process of combining the Fourier transforms of a shorter starting sequence.

2. (Currently Amended) A method according to claim 1 in which the reference signal sequence is represented by a Golay sequence pair and the step of ~~forming~~ computing the Fourier transform of the reference signal sequence comprises use of a computation unit which repeatedly:

(a) ~~combining~~ combines the Fourier transform of a first member of a Golay pair with the Fourier transform of the second member of that Golay pair to produce a first member of a new Golay pair; and

(b) ~~combining~~ combines the Fourier transform of a first member of a Golay pair with the Fourier transform of the second member of that Golay pair to produce a second member of a new Golay pair.

3. (Currently Amended) A method according to claim 2 in which said combining uses only the machine-implemented operations of digital signal inverting, addition, and multiplication by $\exp(\pm j2\pi f\Phi)$, where f is frequency and Φ is a shift value dependent on the length of the sequence.

4. (Previously Presented) A method according to claim 3 in which the transforms $A_K(f)$, $B_K(f)$ of a Golay pair are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) + B_{K-1}(f)\exp(-j2\pi\Phi f)$$

$$B_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) - B_{K-1}(f)\exp(-j2\pi\Phi f)$$

where Φ is half the length of each member of the shorter pair, and f is frequency.

5. (Original) A method according to claim 3 in which the transforms $A_K(f)$, $B_K(f)$ of a Golay pair are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f) \exp(+j2\pi\theta f_{K-1} f) + B_{K-1}(f) \exp(-j2\pi\theta_{K-1} f)$$

$$B_K(f) := A_{K-1}(f) \exp(+j2\pi\theta_{K-1} f) - B_{K-1}(f) \exp(-j2\pi\theta_{K-1} f)$$

where θ are time intervals dependent on the number of iterations, and f is frequency.

6. (Currently Amended) A method according to claim 4 in which the iteration commences with a Golay pair, each member of which has a length of 1.

7. (Currently Amended) A method according to claim 2 in which said combining uses only the operations of inverting, addition, and multiplication by $\exp(\pm j2\pi f\Phi)$ where f is frequency and Φ is a shift value dependent on the length of the sequence.

8. (Previously Presented) A method according to claim 7 in which the transforms $A_K(f)$, $B_K(f)$ are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$A_K(f) := A_{K-1}(f) \exp(+j2\pi\Phi f) + B_{K-1}(f) \exp(-j2\pi\Phi f)$

$B_K(f) := A_{K-1}(f) \exp(+j2\pi\Phi f) + B_{K-1}(f) \exp(-j2\pi\Phi f)$

where Φ is half the length of each member of the shorter pair, and f is frequency.

9. (Original) A method according to claim 7 in which the transforms $A_K(f)$, $B_K(f)$ are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$A_K(f) := A_{K-1}(f) \exp(+j2\pi\theta_{K-1}f) + B_{K-1}(f) \exp(-j2\pi\theta_{K-1}f)$

$B_K(f) := A_{K-1}(f) \exp(+j2\pi\theta_{K-1}f) - B_{K-1}(f) \exp(-j2\pi\theta_{K-1}f)$

where θ are time intervals dependent on the number of iterations, and f is frequency.

10. (Cancelled)

11. (New) A matched signal filtering apparatus using a reference signal sequence comprising a plurality of signal samples at regular sampling time intervals λ, said apparatus comprising:

means for receiving an input time domain signal r(t) to be filtered, said signal r(t) representing at least one physical characteristic of at least one tangible thing;

means for sampling the input time domain signal r(t), at sampling time intervals τ that are not synchronized to the sampling intervals λ of the reference signal sequence, to produce an input signal sequence;

means for computing the Fourier transform of the input signal to be filtered evaluated at discrete frequencies f determined by the intervals τ at which the input signal is sampled;

means for computing the Fourier transform of the reference sequence, evaluated at the same discrete frequencies f;

means for forming the product of the two Fourier transforms; and

means for computing the inverse Fourier transform of said product to produce an output time domain signal y(t) representing a filtered version of the input time domain signal, now transformed to provide a more useful representation of said physical characteristic of said tangible thing;

wherein the reference sequence is defined as a function of time by a process of iteratively combining shifted versions of shorter sequences, and

wherein computing the Fourier transform of the reference sequence comprises an iterative process of combining the Fourier transforms of a shorter starting sequence.

12. (New) Apparatus according to claim 11 in which the reference signal sequence is represented by a Golay sequence pair and the means for computing the Fourier transform of the reference signal sequence comprises use of a computation unit which repeatedly:

(a) combines the Fourier transform of a first member of a Golay pair with the Fourier transform of the second member of that Golay pair to produce a first member of a new Golay pair; and

(b) combines the Fourier transform of a first member of a Golay pair with the Fourier transform of the second member of that Golay pair to produce a second member of a new Golay pair.

13. (New) Apparatus according to claim 12 in which said computation unit uses only the machine-implemented operations of digital signal inverting, addition, and multiplication by $\exp(\pm j2\pi f\Phi)$, where f is frequency and Φ is a shift value dependent on the length of the sequence.

14. (New) Apparatus according to claim 13 in which the transforms $A_K(f)$, $B_K(f)$ of a Golay pair are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) + B_{K-1}(f)\exp(-j2\pi\Phi f)$$

$$B_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) - B_{K-1}(f)\exp(-j2\pi\Phi f)$$

where Φ is half the length of each member of the shorter pair, and f is frequency.

15. (New) Apparatus according to claim 13 in which the transforms $A_K(f)$, $B_K(f)$ of a Golay pair are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f)\exp(+j2\pi\theta f_{K-1}f) + B_{K-1}(f)\exp(-j2\pi\theta_{K-1}f)$$

$$B_K(f) := A_{K-1}(f)\exp(+j2\pi\theta_{K-1}f) - B_{K-1}(f)\exp(-j2\pi\theta_{K-1}f)$$

where θ are time intervals dependent on the number of iterations, and f is frequency.

16. (New) Apparatus according to claim 14 in which the iteration commences with a Golay pair, each member of which has a length of 1.

17. (New) Apparatus according to claim 12 in which said combining uses only the operations of inverting, addition, and multiplication by $\exp(\pm j2\pi f\Phi)$ where f is frequency and Φ is a shift value dependent on the length of the sequence.

18. (New) Apparatus according to claim 17 in which the transforms $A_K(f)$, $B_K(f)$ are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) + B_{K-1}(f)\exp(-j2\pi\Phi f)$$

$$B_K(f) := A_{K-1}(f)\exp(+j2\pi\Phi f) + B_{K-1}(f)\exp(-j2\pi\Phi f)$$

where Φ is half the length of each member of the shorter pair, and f is frequency.

19. (New) Apparatus according to claim 17 in which the transforms $A_K(f)$, $B_K(f)$ are formed from the transforms $A_{K-1}(f)$, $B_{K-1}(f)$ of a shorter such pair according to the relationships

$$A_K(f) := A_{K-1}(f)\exp(+j2\pi\theta_{K-1}f) + B_{K-1}(f)\exp(-j2\pi\theta_{K-1}f)$$

$$B_K(f) := A_{K-1}(f)\exp(+j2\pi\theta_{K-1}f) - B_{K-1}(f)\exp(-j2\pi\theta_{K-1}f)$$

where θ are time intervals dependent on the number of iterations, and f is frequency.